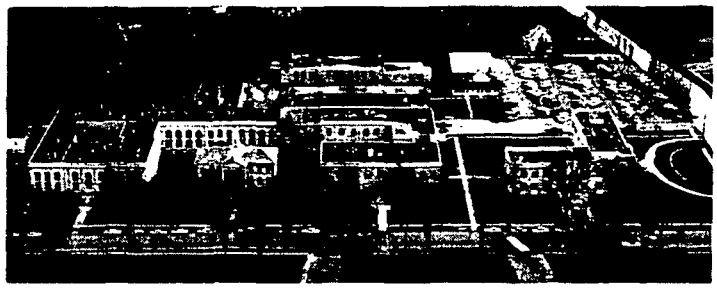

THE INSTITUTE OF PAPER CHEMISTRY, APPLETON, WISCONSIN

EVALUATION OF MODEL A MULLEN DIAPHRAGMS

RECEIVED IN DECEMBER 1976

Project 2694-4

Report Six

A Progress Report

to

FOURDRINIER KRAFT BOARD GROUP
OF THE
AMERICAN PAPER INSTITUTE

February 3, 1977

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

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TABLE OF CONTENTS

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SUMMARY

Under the authorization of the Fourdrinier Kraft Board Group, the Institute has cooperatively worked with B. F. Perkins, Division of Roehlen Industries, to evaluate Model A type Mullen diaphragms supplied to the industry. The objective is to determine that diaphragms supplied to the trade meet Rule 41 requirements. Recently "Perkins" submitted thirty diaphragms from a recent production run for evaluation. The results indicated that:

1. Based on the Institute measurements, all of the diaphragms exhibited pressures which exceeded the Rule 41 upper limit of the 30 psig. For example, based on the Institute results, the overall average pressure was 35.2 psig and the pressures for individual diaphragms range from about 31 to 40 psig. In the case of the measurements by Perkins, 24 of the 30 diaphragms exhibited pressures above 30 psig.

2. Because of the high pressures obtained, it is the Institute's understanding that "Perkins" will reject the lot — either in whole or part.

3. The diaphragm pressure measurements made by "Perkins" averaged 2.3 psig lower than the Institute results. This level of agreement is poorer than obtained in past work and indicates that future work is needed to bring the Institute and Perkins tests into better agreement.

INTRODUCTION

For some time The Institute of Paper Chemistry has cooperatively worked with B. F. Perkins, Division of Roehlen Industries, to evaluate Model A type Mullen diaphragms supplied to the industry. This work was initiated by the Fourdrinier Kraft Board Institute, Inc. under Project 1108-26 and continued under Project 2694-4.

The basic objective is to assist the manufacturer in the evaluation of diaphragm pressure characteristics in order to determine that diaphragms supplied to the industry meet Rule 41 requirements.

Thirty diaphragms from a recent diaphragm order by "Perkins" were recently evaluated by the Institute. The results are summarized herein.

PROCEDURES

The thirty diaphragms received came from various mold cavities. Each of the diaphragms was evaluated by "Perkins" and then forwarded to the Institute for testing. The Institute procedure for evaluation of the diaphragms is as follows:

1. Attach a 120-psig gage to the Mullen tester using a rubber coupling.
2. Insert the diaphragm in the tester using a clamping force of 1000 lb when tightening the clamping ring.
3. Adjust the diaphragm so that its top surface is level with the top of the bottom platen.
4. Distend the diaphragm to 0.71 inch, ten times.
5. Check the level of the diaphragm and adjust, if necessary.
6. Distend the diaphragm five times to 0.375 inch distention. Record each pressure reading and average.

DISCUSSION OF RESULTS

The results obtained are summarized in Table I. The maximum, minimum and average diaphragm pressures obtained by the Institute and B. F. Perkins were as follows:

	Diaphragm Pressure, psig		
	Institute	Perkins	Diff.
Maximum	40.1	37.6	--
Minimum	31.3	29.4	--
Average	35.2	32.9	2.3

Based on the Institute measurements, all of the diaphragms exhibited pressures above the Rule 41 upper limit of 30 psig. The Institute average of 35.2 psig was considerably higher than the 30 psig specification limit. The results obtained by Perkins also indicated that most of the diaphragms exceeded the 30 psig limit although the diaphragm pressures obtained by Perkins were about 2.3 psig lower on the average. The diaphragms also exhibited a rather wide range of pressures, e.g., from 31.3 to 40.1 psig in the Institute tests and from 29.4 to 37.6 psig in Perkins tests. This range is considerably greater than obtained in previous work (1).

As mentioned, the "Perkins" diaphragms pressure measurements averaged 2.3 psig lower than the Institute results. This difference is considerably greater than the 0.4 psig difference obtained in previous work (1). Because of the poorer agreement obtained in these comparisons, it appears that additional work will be required in the future to bring the Institute and Perkins tests into better agreement. (Note: the Institute's pressure gage was calibrated prior to carrying out the tests in Table I.)

TABLE I

DIAPHRAGM PRESSURE RESULTS

Box No.[a]	Perkins Inspection Date	B. F. Perkins Diaphragm Number	B. F. Perkins Diaphragm Pressure, psig[b]	Institute Diaphragm Number	Institute Diaphragm Pressure, psig[b]	Diff., psig
1	12-7-76	EP1	31.8	EP1	33.3	+1.5
		EP22	30.0	EP22	32.5	+2.5
		EP22	31.8	EP22	34.4	+2.6
		EP4	35.8	EP4	39.1	+3.3
		EP25	32.0	EP25	34.4	+2.4
		EP21	31.6	EP21	34.1	+2.5
		EP17	29.5	EP17	31.5	+2.0
		EP4	29.4	EP4	32.9	+3.5
		EP19	30.8	EP19	32.4	+1.6
		EP21	31.4	EP21	33.3	+1.9
		Av.	31.4		33.8	+2.4
2	12-7-76	EP11	29.6	EP11	31.3	+1.7
		EP2	31.4	EP2	32.8	+1.4
		EP3	30.0	EP3	32.4	+2.4
		EP15	34.6	EP15	39.5	+4.9
		EP15	32.6	EP15	33.7	+1.1
		EP23	34.2	EP23	36.5	+2.3
		EP6	32.0	EP6	37.4	+5.4
		EP18	30.0	EP18	32.5	+2.5
		EP10	33.9	EP10	36.3	+2.4
		EP20	31.0	EP20	32.4	+1.4
		Av.	31.9		34.5	+2.6
3	12-8-76	EP23	33.4	EP23	34.7	+1.3
		EP10	33.5	EP10	35.8	+2.3
		EP6	37.6	EP6	40.1	+2.5
		EP15	35.4	EP15	37.2	+1.8
		EP16	36.2	EP16	38.1	+1.9
		EP4	36.8	EP4	39.3	+2.5
		EP17	35.4	EP17	36.9	+1.5
		EP2	36.5	EP2	39.3	+2.8
		EP20	35.6	EP20	36.8	+1.2
		EP22	33.9	EP22	35.9	+2.0
		Av.	35.4		37.4	+2.0
		Grand Av.	32.9		35.2	+2.3

[a] Box numbers were arbitrarily assigned at the Institute.

[b] Diaphragm pressure at 3/8 inch distention.

The above results were relayed to Perkins. It is the Institute's understanding that this lot of diaphragms will be rejected. However, Perkins also advised that their stock of diaphragms is quite low and it might be necessary to retain a portion of the lot to supply to the trade until a new batch can be procured. Presumably, customers would be advised of the situation.

It is known that the application of a small amount of a lubricant such as graphite to the upper surface of the diaphragm surface will generally lower the pressure. Thus, in the case of diaphragms exhibiting pressures above the Rule 41 upper limit, a graphite treatment will generally lower the diaphragm pressure and bring it within the 23-30 psig pressure limits. For example, a graphite treatment of one of the diaphragms in Table I gave the following results:

	Diaphragm Pressure at 3/8 Inch, psig
As received	35.9
After graphite treatment	28.4
Diff., psig	7.5

Thus, the graphite treatment effected a substantial decrease in the diaphragm pressure. It was suggested to "Perkins" that this technique could be used as an interim measure until a new batch of diaphragms having satisfactory pressure characteristics is obtained. Thus, "Perkins" could either treat the diaphragms before shipment or advise purchasers to use the technique if needed.

LITERATURE CITED

1. Evaluation of Jumbo Mullen diaphragms received in May 1971. Project 2694-4, Report Four to Technical Division, FKI, July 7, 1971.

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